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A Patient Identity Matching Service for Cloud-based Performance Management of Community Healthcare

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Abstract

Managing patients with chronic and complex health conditions poses significant challenges to community healthcare in terms of quality and cost of care delivery. These challenges can be addressed through systematic performance management of care processes. However, heterogeneous healthcare data silos and inconsistent patient identity, coupled with patient privacy regulations, limit our ability to achieve systematic performance management of community healthcare. Cloud computing is an emerging technology that could be leveraged to address the issue of heterogeneous healthcare data silos, if a regional health authority provided data hosting with appropriate data sharing agreements and identity management. In this paper, we present a Patient Identity Matching Service for correlating cloud-hosted data from multiple stakeholders into a common data model to support performance management of community healthcare. We illustrate its use in a case study of performance management for community care of chronic and complex health conditions at a regional health authority in Canada.

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1. Introduction

In general, people in developed countries are living longer, but with a greater incidence of chronic and complex health conditions, challenging the healthcare system with spiraling costs¹. In response, there is a need to transform the

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healthcare system to efficiently provide care for complex patients². In doing so, government and healthcare organizations want better accountability for money spent on healthcare delivery³ but this requires performance management of care processes across all the stakeholders in the healthcare ecosystem⁴. Achieving this requires coordination and integration of data across disparate healthcare information systems².

The complex patient population, defined as having complex medical, social and behavioral issues, is becoming a focus of healthcare system redesign⁵. Complex patient management is challenging because patients have multiple (i.e. co-morbid) health conditions, many of them chronic, which may require care delivery and services from a variety of healthcare providers⁶ within the community. Further, complex patients may be managed using multiple clinical practice guidelines (CPGs) which may have conflicting recommendations about medications or treatments⁷. Thus, it is crucial that patient care be managed effectively to prevent adverse interactions from conflicting medications and to ensure that all care providers are aligned with care delivery.

These challenges can be addressed through systematic performance management of care processes. However, heterogeneous healthcare data silos and inconsistent patient identity, coupled with patient privacy regulations, limit our ability to achieve systematic performance management of community healthcare. These result in fragmentation of efforts and the inability of stakeholders to coordinate care delivery across the healthcare domain⁸ with much of the data exchange still being done manually. Attempts to address these factors individually often leads to unintended consequences (e.g. social, legal and workflow consequences) related to governance and behavioral issues that arise from technology-mediated connectivity⁹. A key aspect of complex patient management is data integration to identify these patients within the community as they receive healthcare from different providers.

Cloud computing is one potential infrastructure for achieving interoperable healthcare solutions¹⁰ and enabling performance management of care processes. It could be leveraged to address the issue of heterogeneous healthcare data silos, if a regional health authority provided data hosting with appropriate data sharing agreements and identity management. This paper introduces a cloud-based Patient Identity Matching Service for correlating cloud-hosted data from multiple stakeholders into a common data model to support performance management of community healthcare. We illustrate its use in a case study of performance management for community care of chronic and complex health conditions at a regional health authority in Canada. We leverage a cloud-based solution enabled by data sharing agreements to address interoperability issues. Our framework supports data hosting, data collection, performance management, and subscription. In particular, it addresses the challenge of identifying complex patients across healthcare providers that do not share a common identifier.

2. Background

Collecting health data in a consistent, standardized and timely manner is important in influencing healthcare decisions. Cloud infrastructure has been proposed to provide a consolidated view of patient-relevant data to healthcare providers¹⁰, which is an important requirement for enabling performance management of care processes. Implementing cloud computing technologies could help healthcare providers to share information, improve collaboration and reduce expenditures on computing infrastructure¹¹.

2.1. Patient Identity Management Problem

Patient identity management is important with cloud hosted data because, typically, in community care, each participating organization uses a different patient identifier (that only they control) for identifying patients. This makes it very difficult to create a consolidated view of patient services for performance management. Accurately identifying a complex patient is critical because identification affects clinical decision making when coordinating services. Improper patient identification negatively impacts management of complex patients through duplication of services, assessments and test results, and increases the cost of care delivery to both the healthcare system and the patient¹².

In the academic literature, profile matching is one approach to patient identification which is traditionally seen as a record linkage problem. While record linking algorithms are common in the literature, most apply to static offline data sets. For cloud-based performance management, data is dynamic and patient identity management needs to be carried out continuously on all incoming data streams.

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